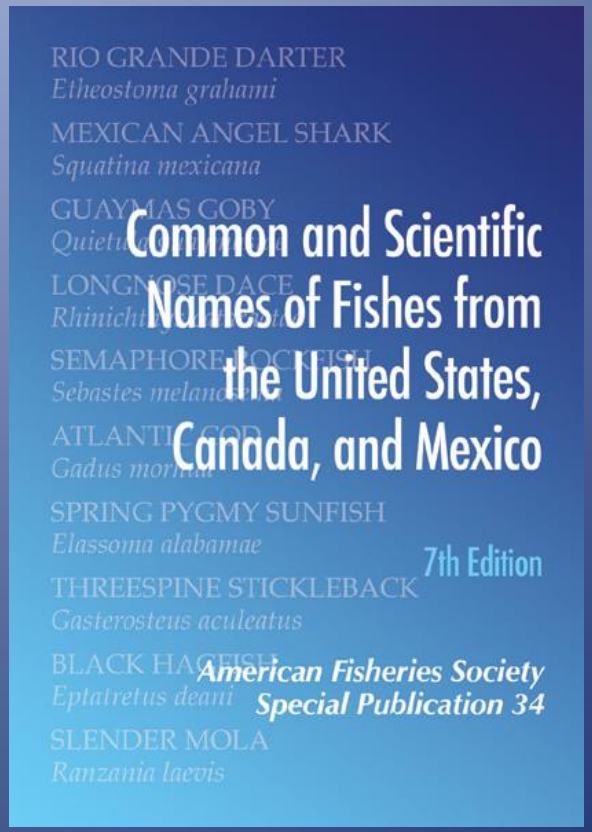
Status of Freshwater Fishes in Texas

Timothy H. Bonner
Department of Biology/Aquatic Station
Texas State University

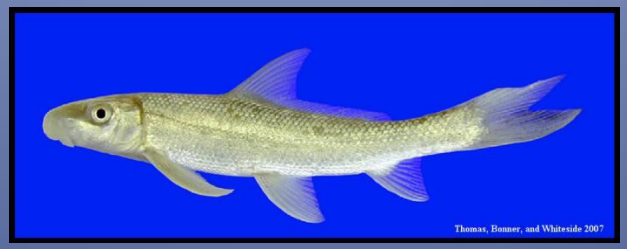
Update Species List

- Species updates:
  - Revisions
  - Complex splits
  - New species



Numerous other recommendations exist…

- …but I do not update (usually) until vetted by AFS committee
  - Lawrence M. Page, Héctor Espinosa-Pérez, Lloyd T. Findley, Carter R. Gilbert, Robert N. Lea, Nicholas E. Mandrak, Richard L. Mayden, and Joseph S. Nelson



Blue Sucker complex

N. stramineus complex

Dionda complex

N. amabilis complex

Notable changes

- Guadalupe Darter split from Dusky Darter

- Western Creek Chubsucker split from Creek Chubsucker

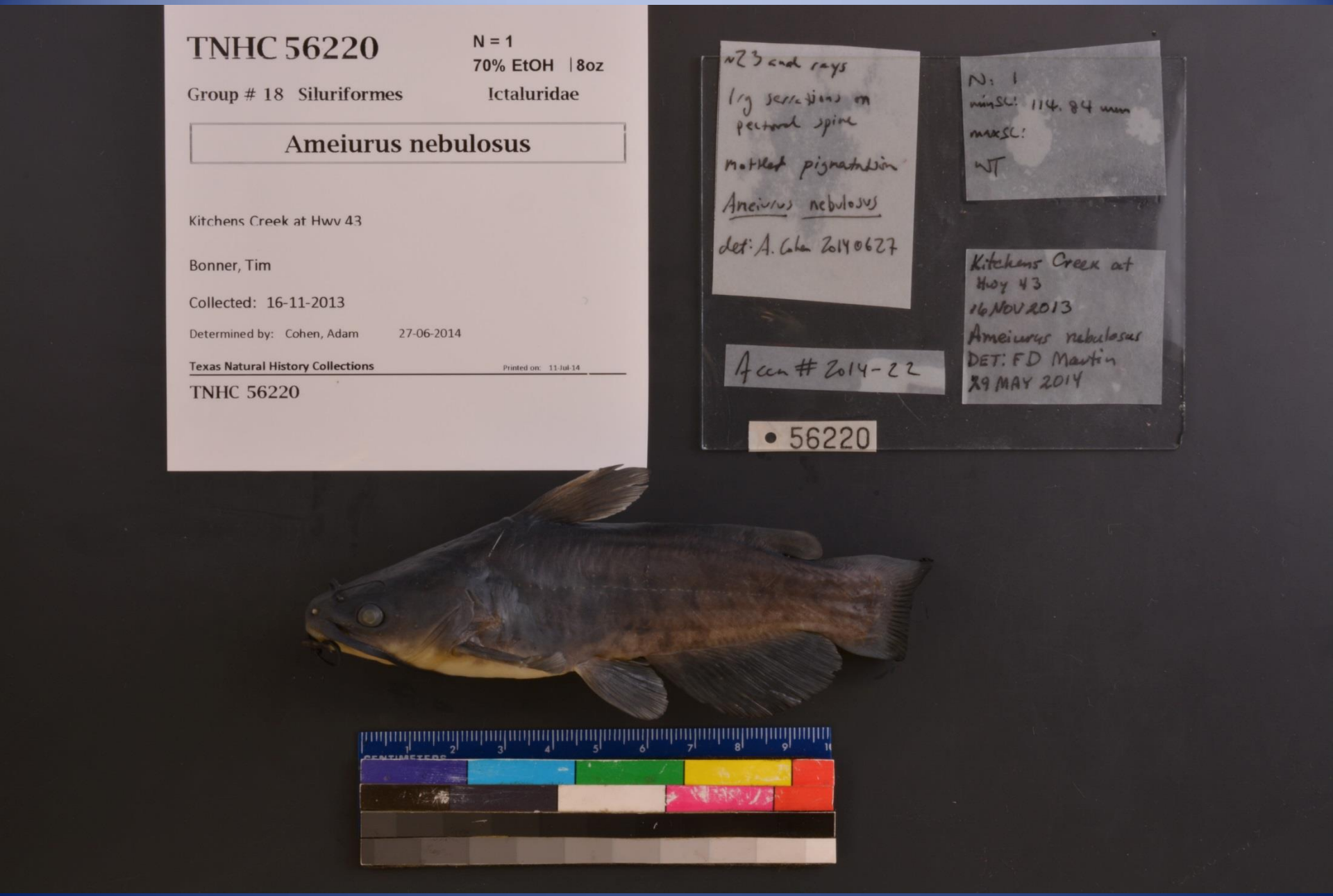
Erimyzon claviformis

Exception:

- San Felipe Gambusia (*G. clarkhubbsi*) is now recognized as Spotfin Gambusia (*G. krumholzi*)
  - Echelle et al. 2013

Additional considerations:

- Expanded (or not) distributions are added:
  - Mississippi Silverside
  - Brown Bullhead


TNHC 56220
N = 1
70% EtOH | 8oz
Group # 18 Siluriformes
Ictaluridae
Ameiurus nebulosus
Kitchens Creek at Hwy 43
Bonner, Tim
Collected: 16-11-2013
Determined by: Cohen, Adam 27-06-2014
Texas Natural History Collections
Printed on: 11-Jul-14
TNHC 56220
~23 anal rays
lrg serrations on pectoral spine
mottled pignathdion
Ameiurus nebulosus
det: A. Cohen 20140627
N: 1
minSL: 114.84 mm
maxSL:
WT
Kitchens Creek at Hwy 43
16 NOV 2013
Ameiurus nebulosus
DET: FD Martin
29 MAY 2014
Accn # 2014-22
• 56220

Additional considerations:

- I do not recognize sub-species
- I accept some marine fishes but not others:
  - Rules (sort of): Marine forms are permanent and functioning within a freshwater system.

Additional considerations:

Accepted: Opossum Pipefish, Stripped Mullet, Mountain Mullet, Hogchocker, et al.

Not accepted: sharks, stingrays, ladyfish, tarpon, anchovy, et al.

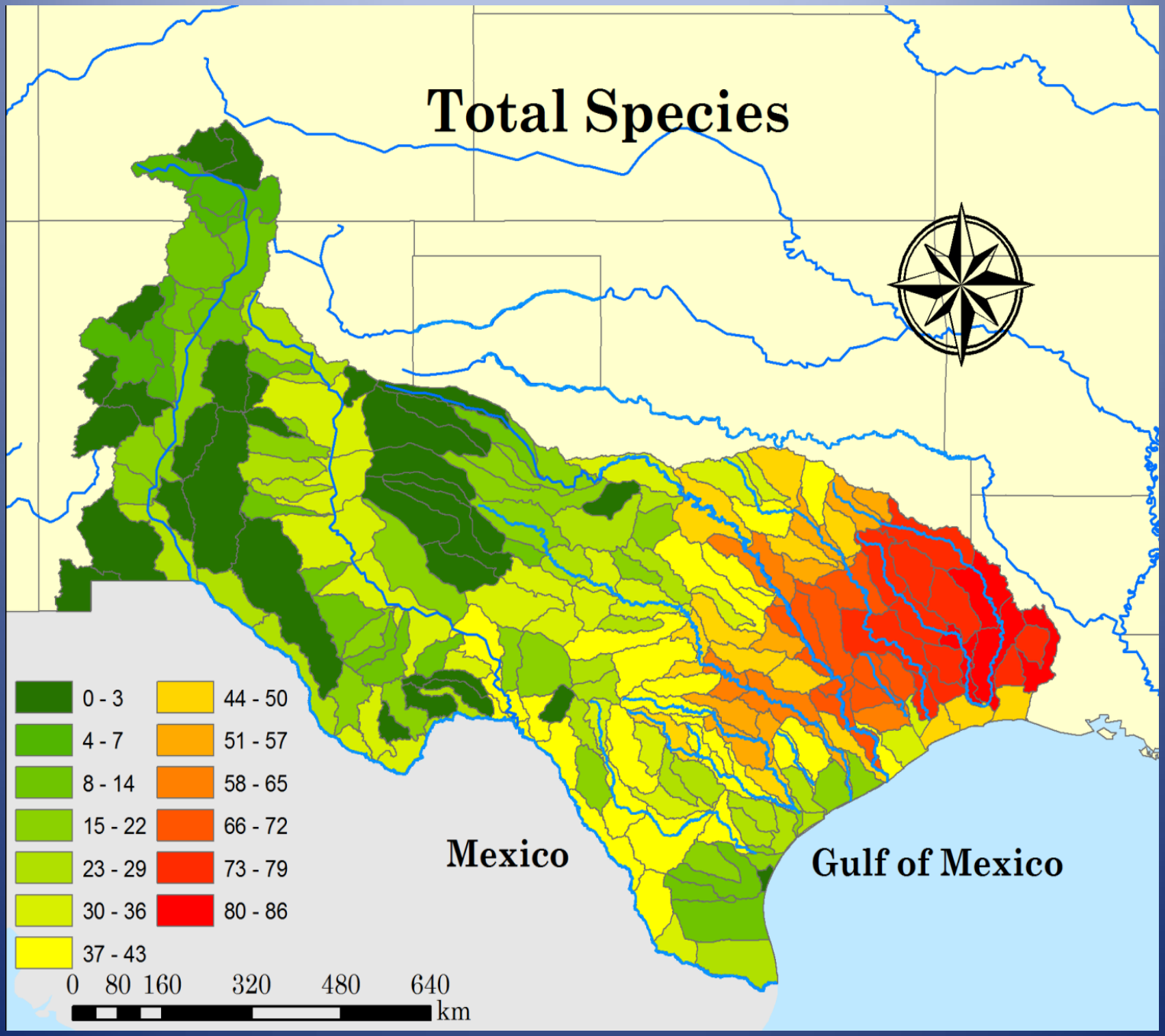
Non-native Fishes

- Over 90 non-native species were stocked in Texas waters
- I consider only sustained populations and those introduced, if verified recently
  - Dropped (EX) Rudd and Yellow Perch
  - Added (EX) Bighead Carp, Variable Platyfish

2013 – Today
List

Current Standing

- 196 fishes in freshwater/inland environments
  - 172 (88%) native
  - 24 (12%) non-native
  - Hubbs et al. (2008): 268 species (177 that spend all or a significant portion of their life in freshwater); 25 non-native


Total Species
0 - 3
4 - 7
8 - 14
15 - 22
23 - 29
30 - 36
37 - 43
44 - 50
51 - 57
58 - 65
66 - 72
73 - 79
80 - 86
0 80 160 320 480 640
km
Mexico
Gulf of Mexico

Information is available

- Send me an email request: TBonner@txstate.edu
- Updated list of Texas fishes
- By drainage basin

Drainage basin fish keys

DRAINAGE BASIN KEYS (CYPRINIDAE)

Texas State University
Department of Biology/Aquatic Station
San Marcos, Texas 78666

May 27, 2014

INDEX

Fish ID Course
w/ Brad Littrell Bio-West ($$)

The Rising STAR of Texas

TEXAS STATE UNIVERSITY-SAN MARCOS
OFFICE OF CONTINUING EDUCATION

Certifies

_____HOURS OF PARTICIPATION

BY

David Cummings

AND SATISFACTORY COMPLETION OF ORGANIZED INSTRUCTION IN

Texas Fish Identification

Tim Bonner
CONTINUING EDUCATION

May 28-29, 2014
DATE

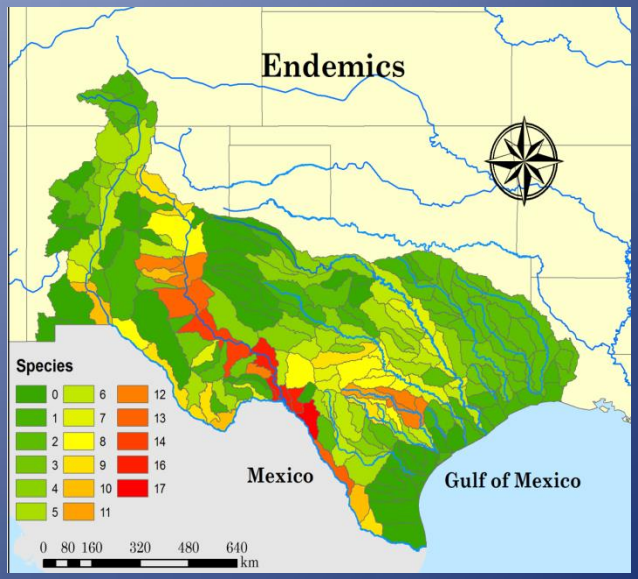
Why keep a list?

- Benefits our understanding of:
  - Species distributions
  - Diversity patterns

Used to describe…

- Evolutionary patterns
- Ecology patterns

Conservation!



Conservation—monitoring threatened and endangered species

- Number of T&E species are represented as a percent of total species (N = 62 vs. 36%)
  - Depends on the dominator
- Updated T&E list (though not perfect)…

Extinctions/Extirpations >75 years

- N = ?
  - Striped Bass
  - White Bass
  - Sturgeons across Texas
  - Quillback Sucker
  - Many others…

Extinctions/Extirpations <75 years

- N = 5 (3%)
  - Extinct: San Marcos Gambusia (USFWS-listed), Amistad Gambusia, Phantom Shiner
  - Extirpated: Bluntnose Shiner (USFWS-listed), Cutthroat Trout

USFWS listing (T&E)

- N = 13 (8%)

- Sharpnose Shiner and Smalleye Shiner (Brazos River drainage) recently added

SGCN listing (State)

- N = 59 (34%)

Overview

- Total N of native Texas Fishes (172)
  - Ext/Exp: 5 (3%)
  - USFWS: 13 (8%)
  - SGCN: 59 (34%)

  - Collectively: 62 (36%) “imperiled fishes of Texas”

  - Minus those with limited distributions only…
    - 16 (9%)

North America (21%)

(Leidy and Moyle 1998)

USA (39%)

Jelks et al. 2008

SE (28%)

Warren et al. 2000

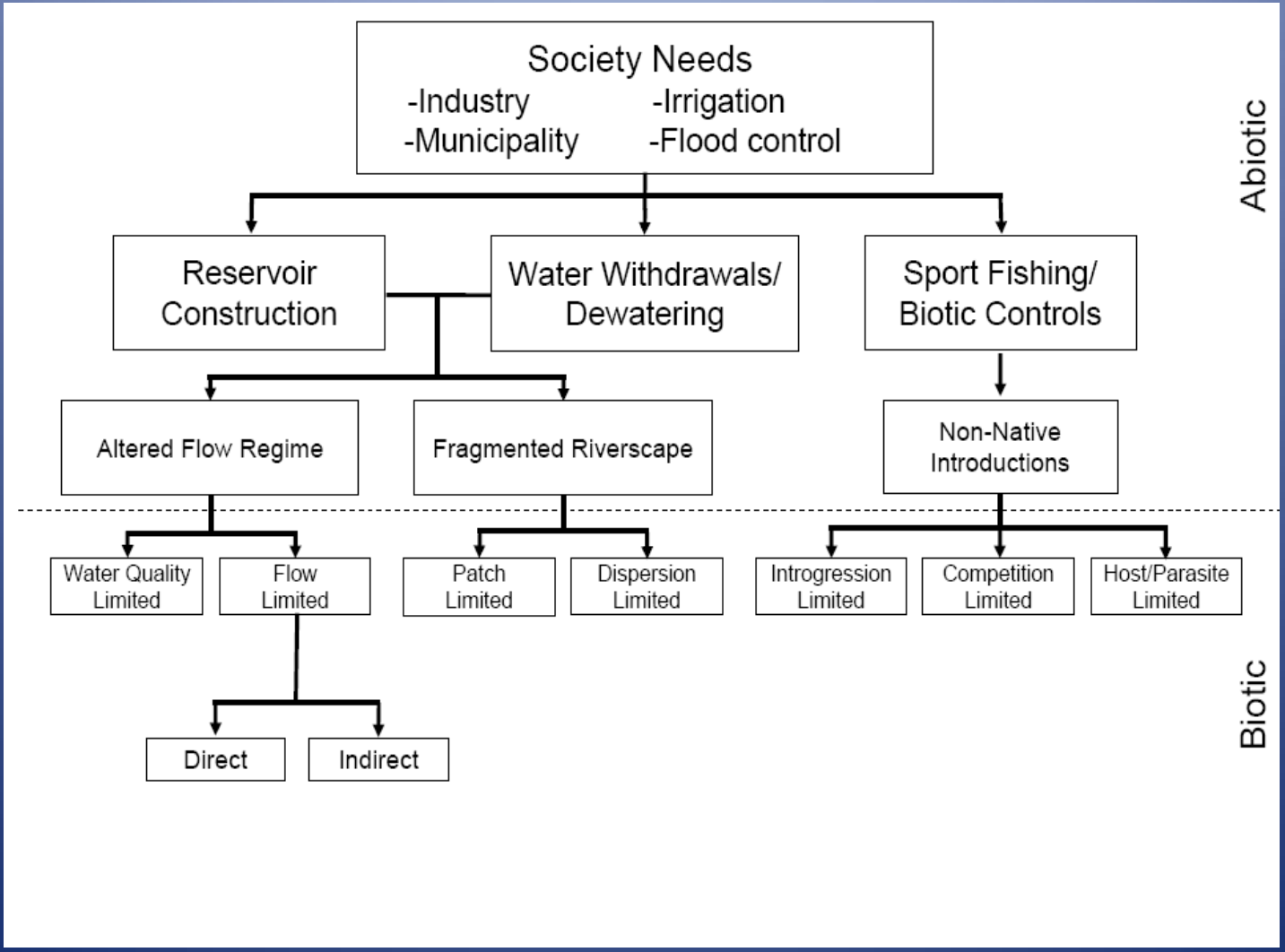
SW (48%)

Warren and Burr 1994

TX (36%)


Brooks
Range
Glacier
Sea Ice
Greenland
Ice Sheet
Berengia
Cordilleran
Ice Sheet
Laurentide
Ice Sheet
Exposed
Continential
Shelf

Threats: “round up the usual suspects”



Research Projects related to Species Conservation

ARTICLE

Rangewide Survey of the Introgressive Status of Guadalupe Bass: Implications for Conservation and Management

Preston T. Bean[*1]
Department of Biology/Aquatic Station, Texas State University–San Marcos, 601 University Drive, San Marcos, Texas 78666, USA

Dijar J. Lutz-Carrillo
Texas Parks and Wildlife Department, A. E. Wood Laboratory, 507 Staples Road, San Marcos, Texas 78666, USA

Timothy H. Bonner
Department of Biology/Aquatic Station, Texas State University–San Marcos, 601 University Drive, San Marcos, Texas 78666, USA

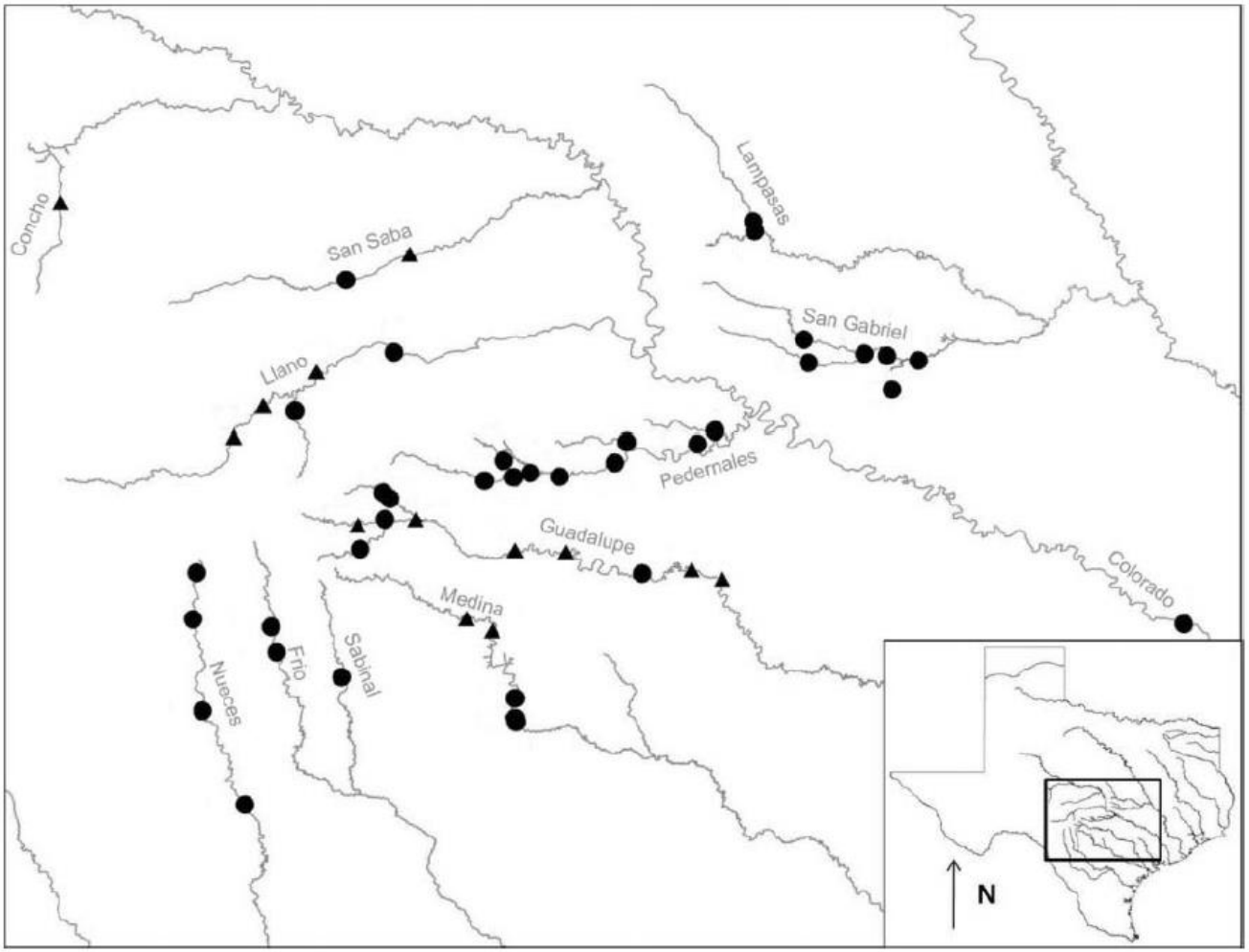


FIGURE 1. Texas localities sampled that encompass the native and introduced range of Guadalupe Bass. Circles indicate sites where no genetic influence of Smallmouth Bass was found, and triangles indicate sites where genetic influence of Smallmouth Bass was found.

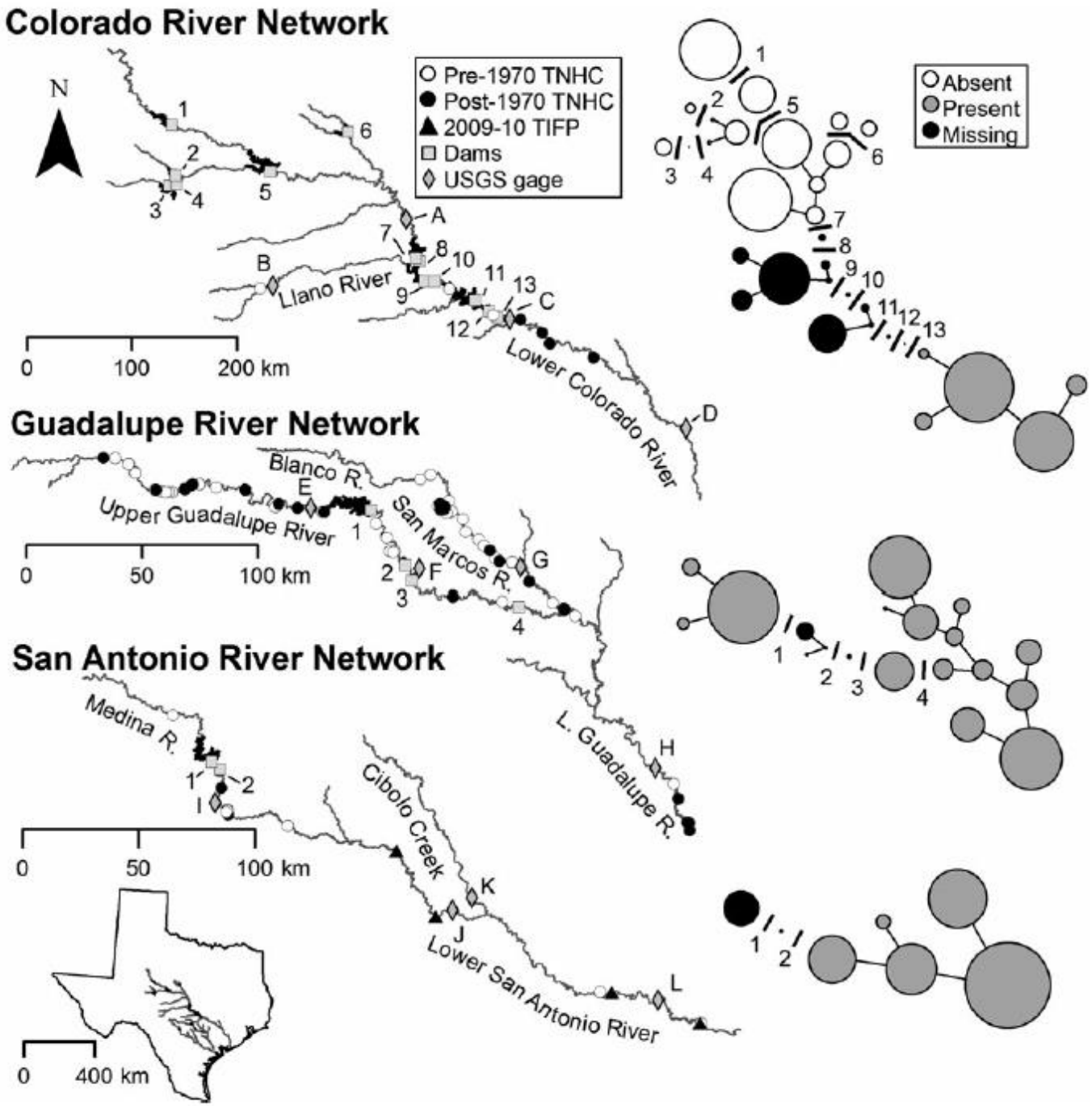
Fragmentation and Drought Legacy Correlate with Distribution of Burrhead Chub in Subtropical Streams of North America

Joshuah S. Perkin*
Division of Biology, Kansas State University, 116 Ackert Hall, Manhattan, Kansas 66506, USA

Zachary R. Shattuck
BIO-WEST, Inc., 1063 West 1400 North, Logan, Utah 84321, USA

Joseph E. Gerken
Kansas Cooperative Fish and Wildlife Research Unit, Kansas State University, 207 Leasure Hall, Manhattan, Kansas 66502, USA

Timothy H. Bonner
Department of Biology/Aquatic Station, Texas State University–San Marcos, 601 University Drive, San Marcos, Texas 78666, USA


Colorado River Network
N
Pre-1970 TNHC
Post-1970 TNHC
2009-10 TIFP
Dams
USGS gage
Absent
Present
Missing
Llano River
Lower Colorado River
0 100 200 km
Guadalupe River Network
Blanco R.
Upper Guadalupe River
San Marcos R.
L. Guadalupe R.
0 50 100 km
San Antonio River Network
Medina R.
Cibolo Creek
Lower San Antonio River
0 50 100 km
0 400 km

RIVER RESEARCH AND APPLICATIONS

River Res. Applic. (2014)

Published online in Wiley Online Library
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HISTORICAL CHANGES IN FISH ASSEMBLAGE COMPOSITION FOLLOWING WATER QUALITY IMPROVEMENT IN THE MAINSTEM TRINITY RIVER OF TEXAS

J. S. PERKIN[a]* AND T. H. BONNER[b]

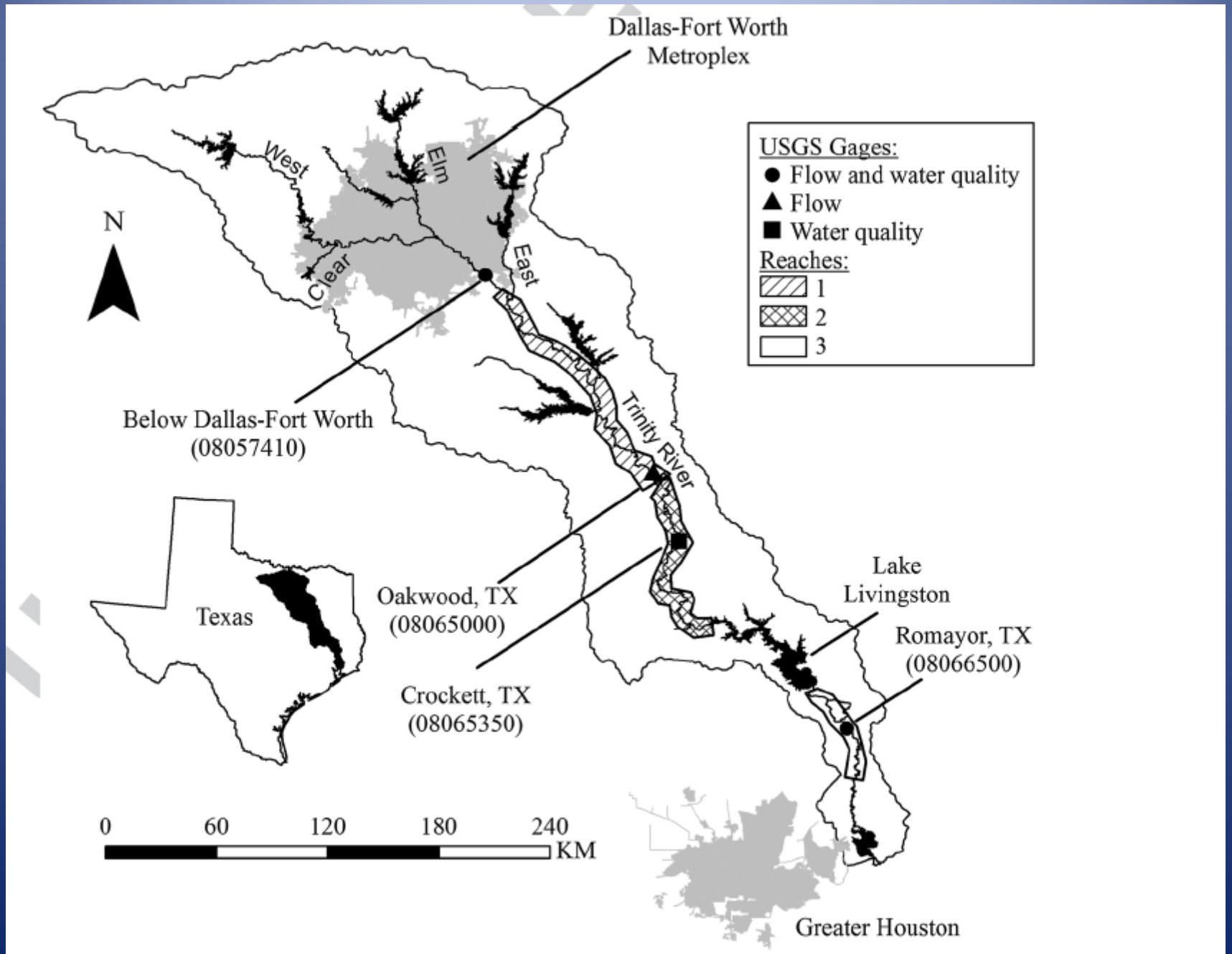
[a] *Department of Biology, Tennessee Technological University, Cookeville, Tennessee, USA*
[b] *Department of Biology/Aquatic Station, Texas State University–San Marcos, San Marcos, Texas, USA*

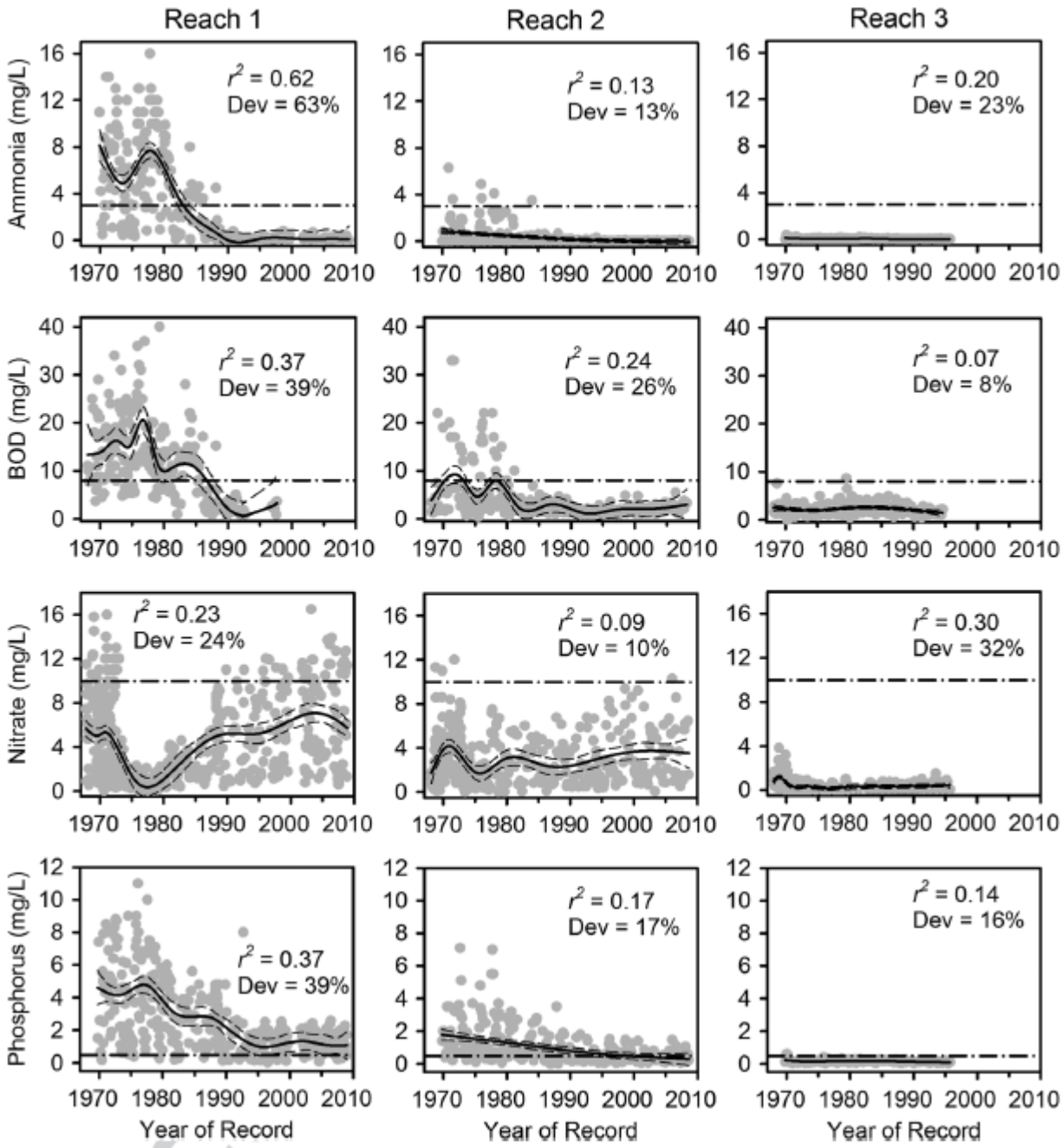
ABSTRACT

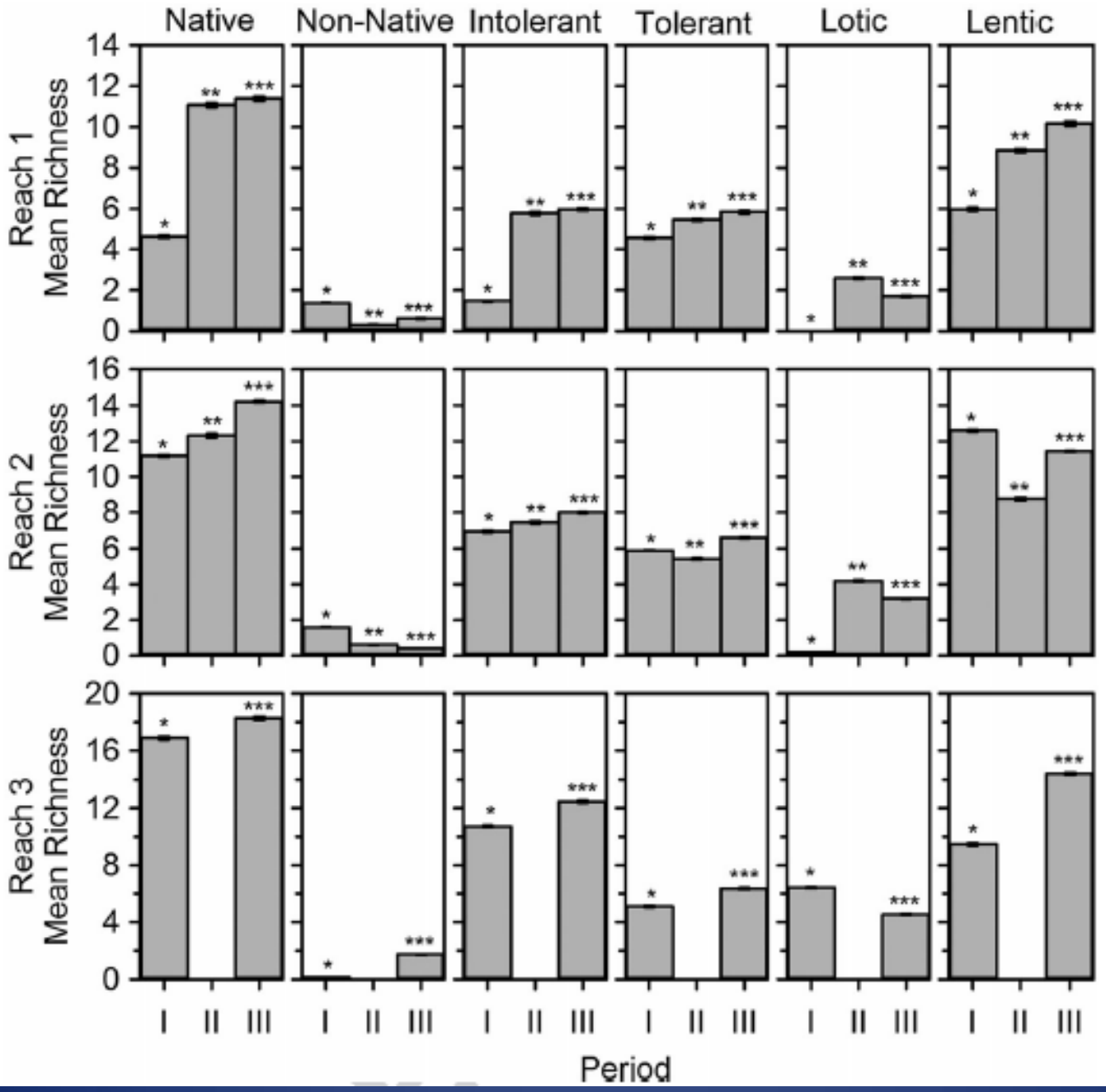
The Clean Water Act of 1972 is credited with improving water quality across the USA, although few long-term studies tracking hydrologic, chemical, and biological responses to cleanup efforts exist. The Trinity River of Texas was plagued by poor water quality for more than a century before passage of legislation to reduce point source pollution from the Dallas–Fort Worth (DFW) Metroplex. We tracked changes in components of flow regime; concentrations of ammonia, nitrate, phosphorus, and biochemical oxygen demand (BOD); and fish assemblage composition in three mainstem reaches during a 40-year period (1968–2008) following implementation of a large-scale cleanup initiative. Results suggest little change in flow regime components such as magnitude, timing, and rate of change among the three reaches during 1968–2008. Concentrations of water quality parameters declined through time and with greater distance from DWF, including the lowest concentrations in the reach downstream of a mainstem reservoir (Lake Livingston). Fish assemblage composition shifts correlated with attenuated nutrient and BOD concentrations, and species richness generally increased among all reaches. Native and intolerant fishes consistently increased through time among all three reaches, although lentic and non-native species also increased downstream of Lake Livingston. Our findings suggest a revitalization of the Trinity River fish assemblage associated with reduced nutrient pollution in DFW (even among distant reaches) and also illustrate potential confounding factors such as stream impoundment and continued nutrient deposition that likely preclude complete recovery.

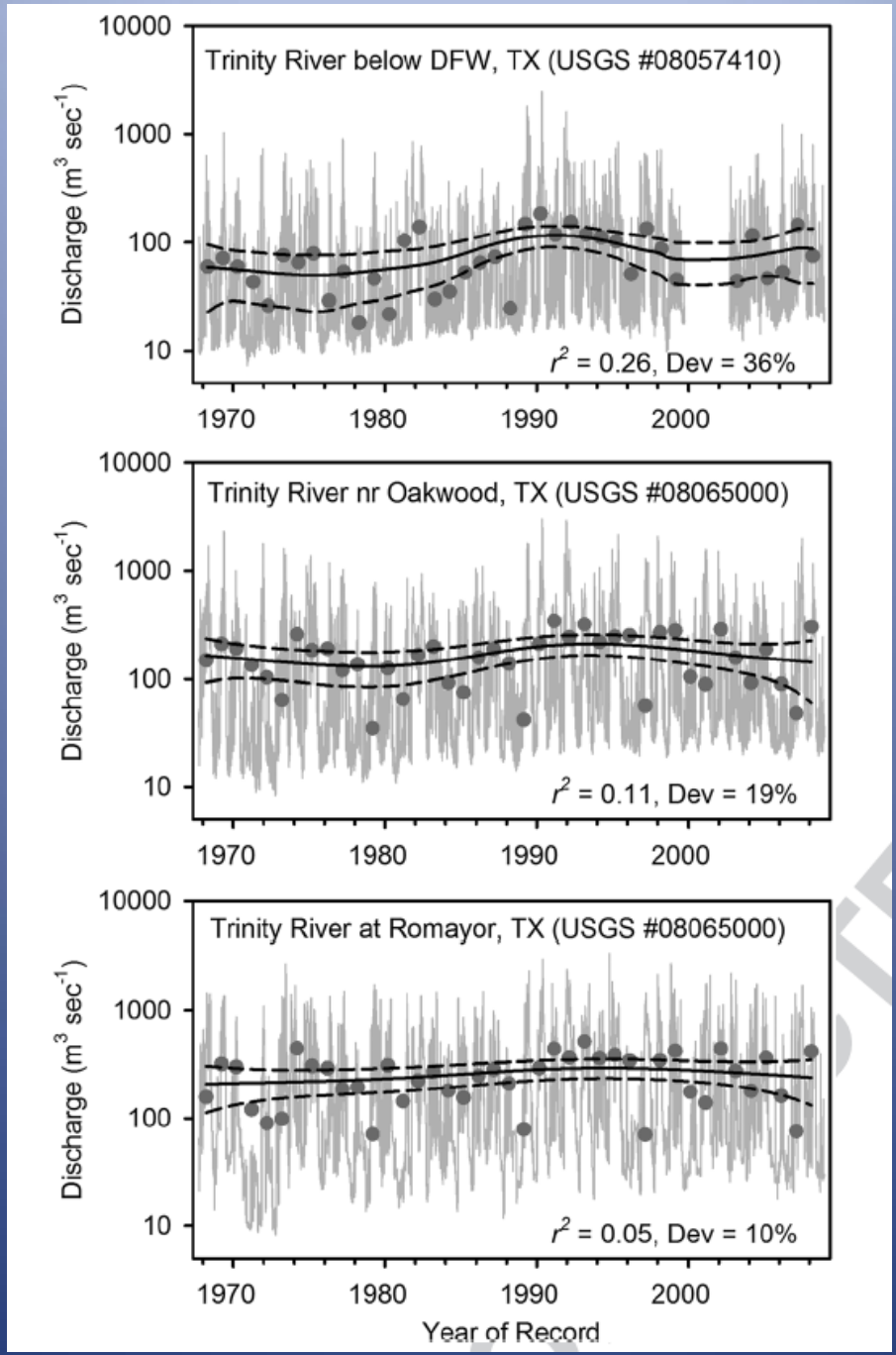
KEY WORDS: flow regime; water quality; nutrient pollution; fish assemblage

Received 6 July 2013; Revised 16 September 2014; Accepted 22 September 2014


Dallas-Fort Worth
Metroplex
West
Fork
Elm
Fork
Clear
East
Fork
N
USGS Gages:
Flow and water quality
Flow
Water quality
Reaches:
1
2
3
Below Dallas-Fort Worth
(08057410)
Trinity River
Texas
Oakwood, TX
(08065000)
Lake
Livingston
Romayor, TX
(08066500)
Crockett, TX
(08065350)
0
60
120
180
240
KM
Greater Houston


Reach 1
Reach 2
Reach 3
Ammonia (mg/L)
BOD (mg/L)
Nitrate (mg/L)
Phosphorus (mg/L)
r^2 = 0.62
Dev = 63%
r^2 = 0.13
Dev = 13%
r^2 = 0.20
Dev = 23%
r^2 = 0.37
Dev = 39%
r^2 = 0.24
Dev = 26%
r^2 = 0.07
Dev = 8%
r^2 = 0.23
Dev = 24%
r^2 = 0.09
Dev = 10%
r^2 = 0.30
Dev = 32%
r^2 = 0.37
Dev = 39%
r^2 = 0.17
Dev = 17%
r^2 = 0.14
Dev = 16%
1970 1980 1990 2000 2010
Year of Record


Native
Non-Native
Intolerant
Tolerant
Lotic
Lentic
Reach 1 Mean Richness
Reach 2 Mean Richness
Reach 3 Mean Richness
Period
I
II
III

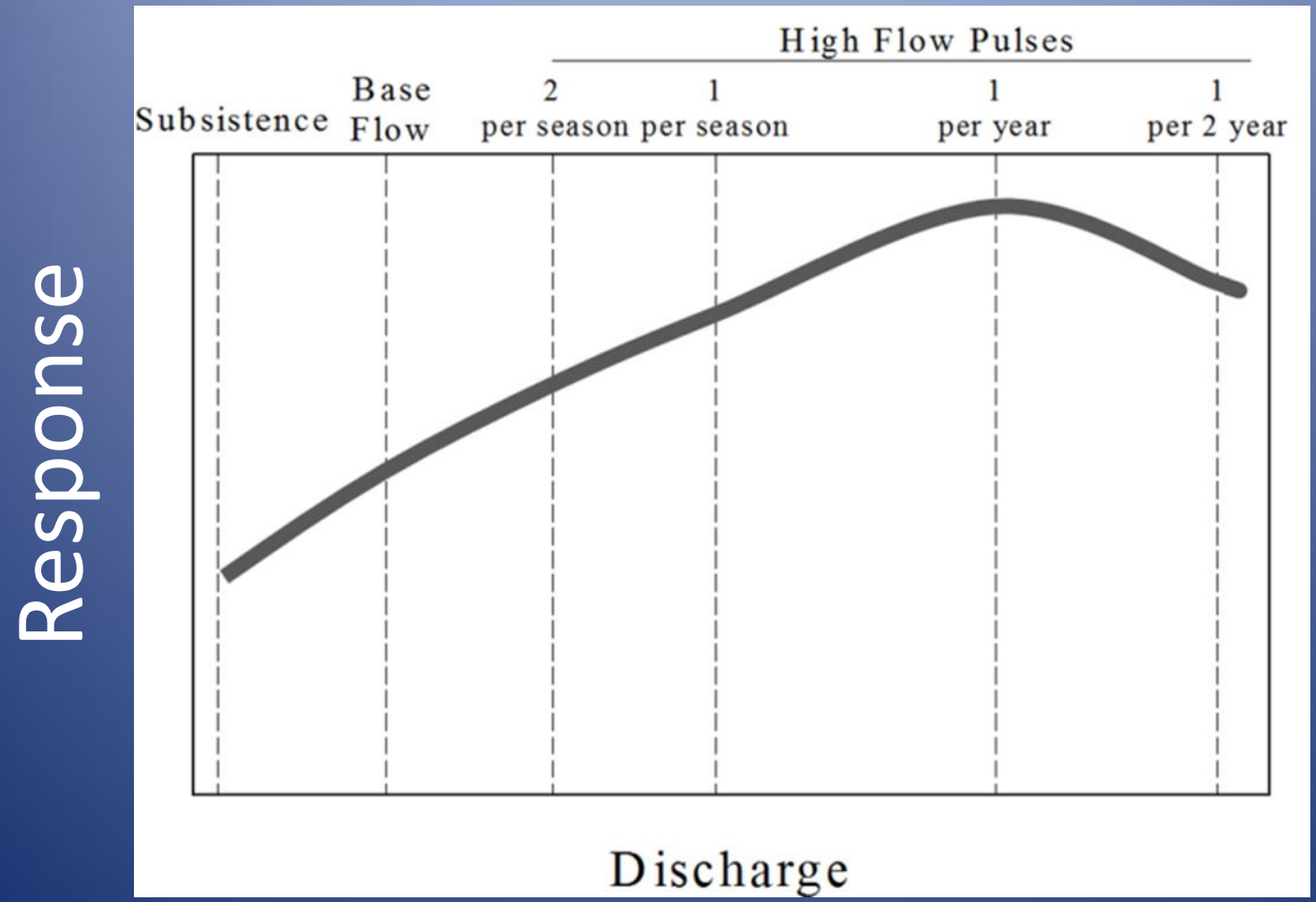

Trinity River below DFW, TX (USGS #08057410)
Discharge (m3 sec-1)
10000
1000
100
10
r2 = 0.26, Dev = 36%
1970
1980
1990
2000
Trinity River nr Oakwood, TX (USGS #08065000)
Discharge (m3 sec-1)
10000
1000
100
10
r2 = 0.11, Dev = 19%
1970
1980
1990
2000
Trinity River at Romayor, TX (USGS #08065000)
Discharge (m3 sec-1)
10000
1000
100
10
r2 = 0.05, Dev = 10%
1970
1980
1990
2000
Year of Record

Water Quantity

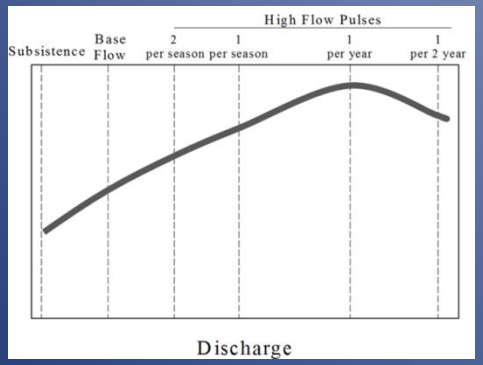
- Natural Flow Paradigm (Poff et al. 1997): aquatic communities are dependent upon the dynamic characters of a flow regime

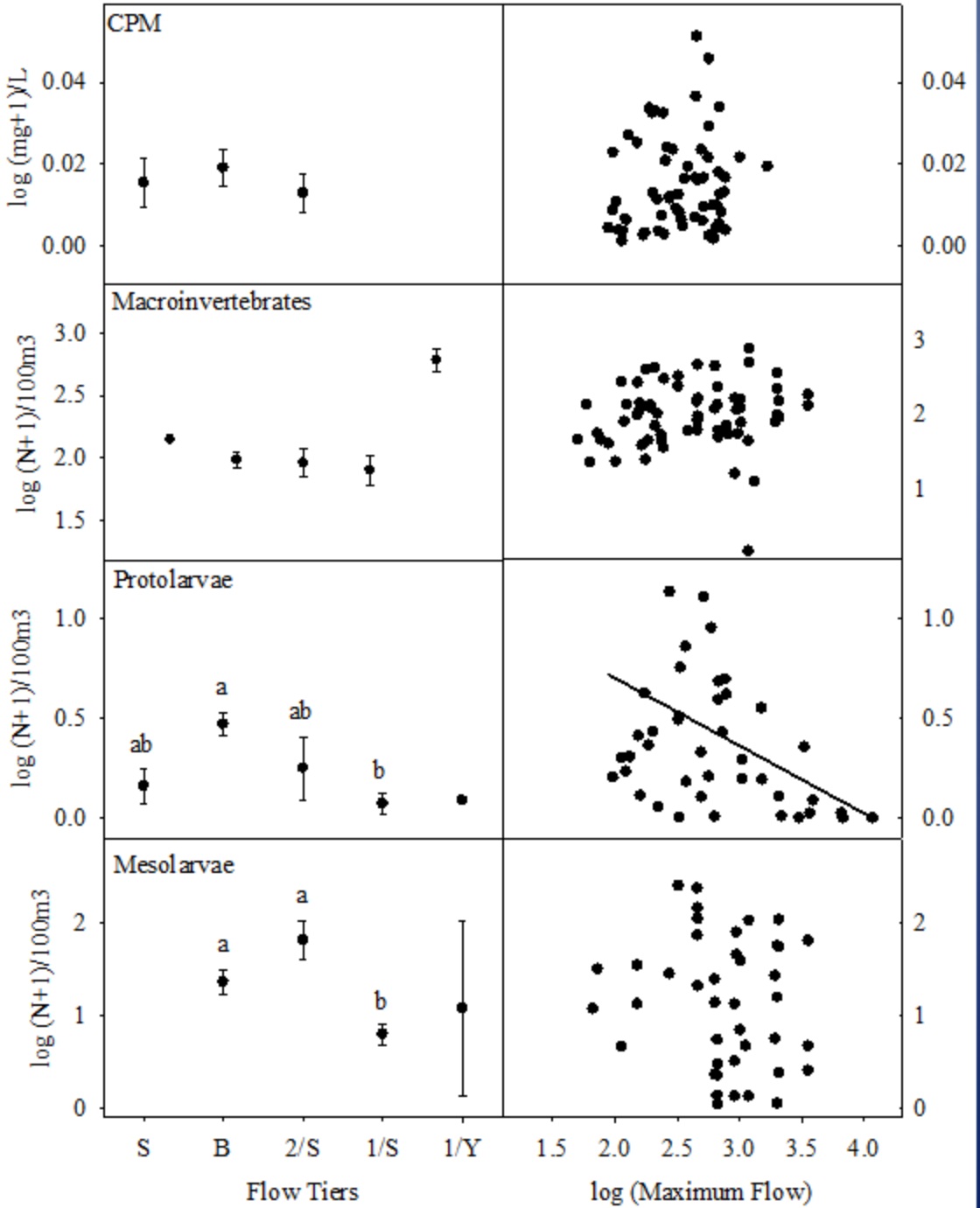
- SBIII BBEST (HEFR), BBASC, TCEQ Standards
  - Goal: maintaining a sound ecological environment

Develop Predictions…

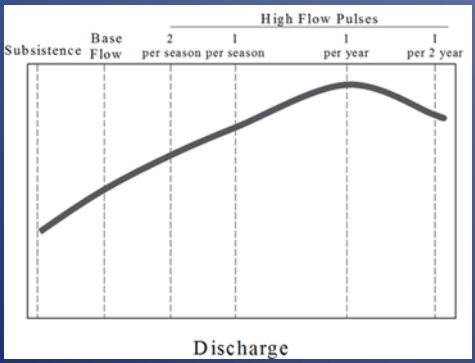


Vaughn, Ruppel, Linam et al.





Ruppel, Vaughn et al.



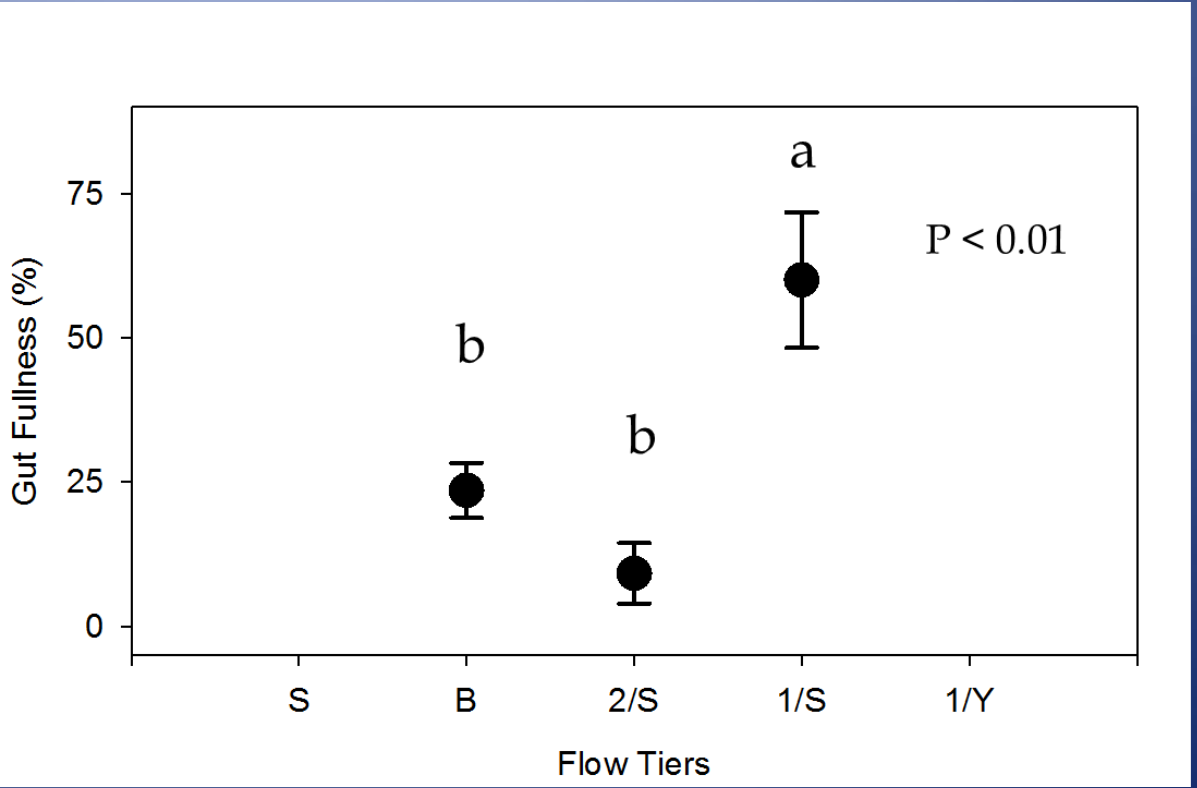
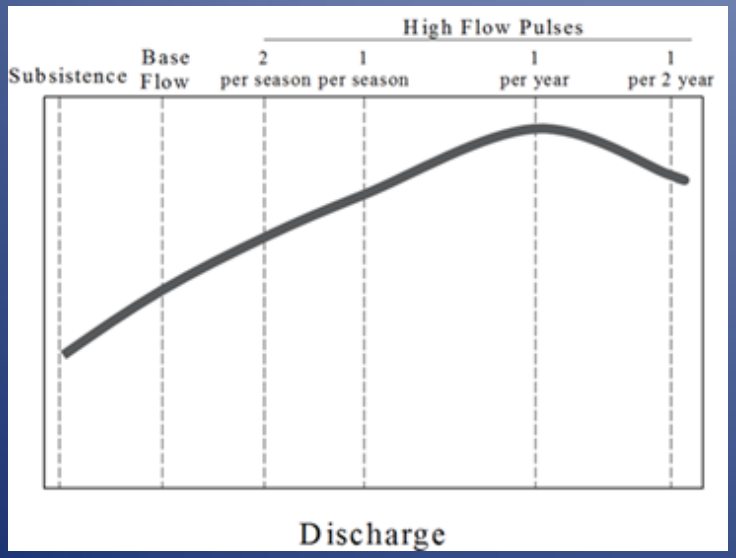
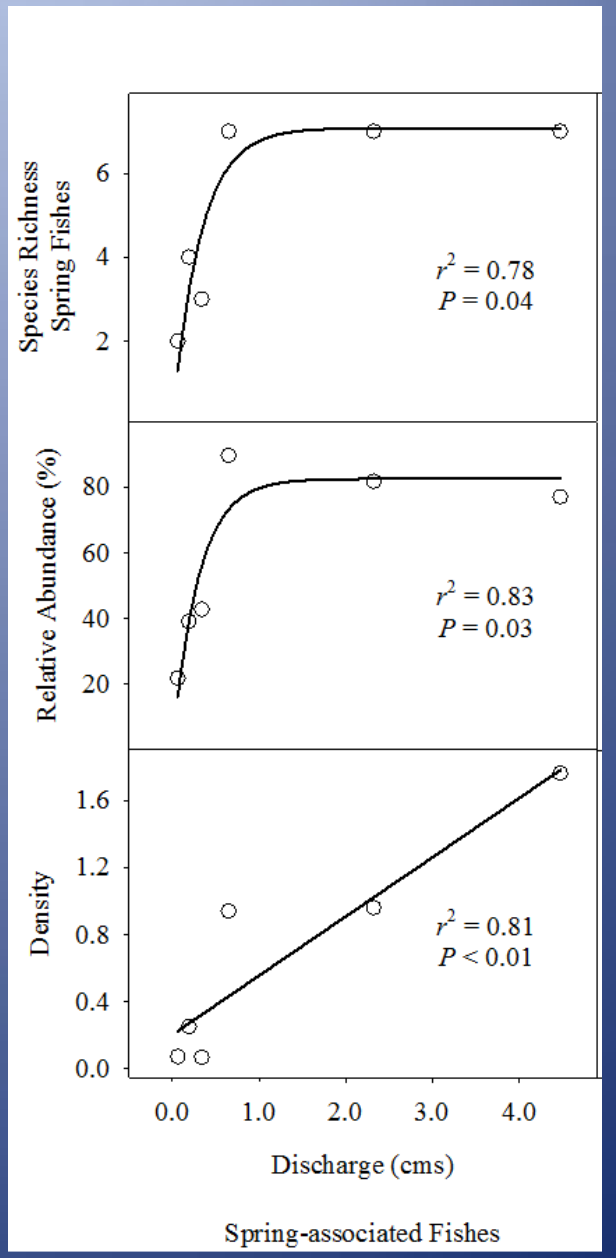


Table 4.1-15. GSA BBASC Environmental Flow Regime Recommendation - Guadalupe River at Cuero[49]

	Winter			Spring			Summer			Fall		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Overbank Flows	Qp: 45,400 cfs with Average Frequency 1 per 5 years Regressed Volume is 869,000 Duration Bound is 91											
	Qp: 24,700 cfs with Average Frequency 1 per 2 years Regressed Volume is 406,000 Duration Bound is 64											
	Qp: 16,600 cfs with Average Frequency 1 per year Regressed Volume is 247,000 Duration Bound is 50											
High Flow Pulses	Qp: 4,610 cfs with Average Frequency 1 per season Regressed Volume is 55,300 Duration Bound is 26			Qp: 8,870 cfs with Average Frequency 1 per season Regressed Volume is 110,000 Duration Bound is 32			Qp: 2,110 cfs with Average Frequency 1 per season Regressed Volume is 19,300 Duration Bound is 17			Qp: 5,200 cfs with Average Frequency 1 per season Regressed Volume is 54,700 Duration Bound is 23		
	Qp: 1,610 cfs with Average Frequency 2 per season Regressed Volume is 14,100 Duration Bound is 13			Qp: 3,370 cfs with Average Frequency 2 per season Regressed Volume is 31,800 Duration Bound is 18			Qp: 1,050 cfs with Average Frequency 2 per season Regressed Volume is 8,300 Duration Bound is 12			Qp: 1,730 cfs with Aver Frequency 2 per seas Regressed Volume is 14 Duration Bound is 1		
Base Flows (cfs)	980			940 680 410			800 600 390			870		
Subsistence Flows (cfs)	130			120			130			86		

- Base Flow Assessment
- Craig et al.





Future
More “validation” work

- Community structure (Fish & Inverts)
- Maybe with mussels
- Adult fish feeding, reproduction, condition
- Habitat (%LWD, % veg, embeddedness)
- Riparian vegetation, bay communities